

DRAFT

ENGINEERING EVALUATION Maguire Correctional Facility (County of San Mateo) PLANT NO. 14880 APPLICATION NO. 9218

BACKGROUND

The Maguire Correctional Facility of Redwood, California is applying for an Authority to Construct and/or Permit to Operate for the following equipment:

- S-6 Cogeneration Plant: Engine, Coast Intelligen 150-IC, 150 kW output, natural gas fuel, 238 HP rated output. Abated by A-1 Catalytic Converter: Johnson Matthey Model CX8-4.**
- S-7 Cogeneration Plant: Engine, Coast Intelligen 150-IC, 150 kW output, natural gas fuel, 238 HP rated output. Abated by A-2 Catalytic Converter: Johnson Matthey Model CX8-4.**

The cogenerator units will be located at 330 Bradford Street Redwood City, CA 94063, on the roof of the correctional facility, which houses inmates. Also the building is within 1000 feet of three schools: Sequoia High School, Orion Alternative School, and Summit Preparatory High School.

EMISSIONS SUMMARY

Annual Emissions:

The CARB certified emission factors for S-6 and S-7 (238 HP- natural gas engine) are listed below, along with the abatement efficiencies for A-1 and A-2 (Johnson Matthey CX8-4):

Pollutant	Emission Factors (g/hp-hr)	Abatement Efficiency	Abated Factors (g/hp-hr)
NO _x	1.5	90%	0.15
CO	3.0	80%	0.60
POC	0.30	50%	0.15
PM ₁₀	negligible	n/a	negligible

The emission factor for SO₂ is assumed to be 5.88E-4 lb/MMBtu, as provided by Chapter 3, Table 3.2-3 of the EPA Document AP-42, Uncontrolled Natural Gas Emission Factors for 4-Stroke Rich-Burn Engines. The abatement efficiencies are conservative figures specified by the CARB manual for Stationary Reciprocating Engines, Section 304.9.2 NSCR Catalyst.

The applicant has specified that S-6 and S-7 will each be operated for 24 hours per day, seven days per week, and 51 weeks per year, for a total of 8568 hours per year. The emissions per year released by one of those engines is as follows:

Maximum Daily Emissions:

A full 24-hour day will be assumed since no daily limits are imposed on intermittent and unexpected operations.

For S-6 or S-7:

$$\begin{aligned} \text{Nox} &= 0.15 \text{ g/hp-hr} \quad (238 \text{ hp}) \quad (24 \text{ hrs/day}) \quad (\text{lb}/454\text{g}) = 1.88 \text{ lb/day} \\ \text{CO} &= 0.6 \text{ g/hp-hr} \quad (238 \text{ hp}) \quad (24 \text{ hrs/day}) \quad (\text{lb}/454\text{g}) = 7.55 \text{ lb/day} \\ \text{POC} &= 0.15 \text{ g/hp-hr} \quad (238 \text{ hp}) \quad (24 \text{ hrs/day}) \quad (\text{lb}/454\text{g}) = 1.89 \text{ lb/day} \\ \text{PM}_{10} &= (0.01 \text{ g/hp-hr}) \quad (238 \text{ hp}) \quad (24 \text{ hrs/day}) \quad (\text{lb}/454\text{g}) = 0.13 \text{ lb/day} \\ \text{SO}_2 &= (5.88\text{E-}4 \text{ lb/MMBtu})(1.55 \text{ MMBtu/hr})(24 \text{ hr/day}) = 0.02 \text{ lb/day} \end{aligned}$$

Plant Cumulative Increase: (tons/year)

Pollutant	Existing	New S-6	New S-7	Total
Nox	0.000	0.340	0.340	0.680
CO	0.000	1.350	1.350	2.700
POC	0.000	0.340	0.340	0.680
PM ₁₀	0.000	0.022	0.022	0.044
SO ₂	0.000	0.004	0.004	0.008
NPOC	0.000	0.000	0.000	0.000

Toxic Risk Screening Analysis (RSA):

Estimated toxic pollutant emissions at the exhaust stack for one engine are summarized in the table on the next page. The emission factors used in the emissions calculations were provided by AP-42 emission factors.

Basis:

- 8568 hr/yr operation (24 hours per day, 7 days per week, 51 weeks per year)
- Firing rate of 1.55 MMBtu/hr
- Emission factors from AP-42 Table 3.2-3 (Uncontrolled Natural Gas Emission Factors for 4-Stroke Rich-Burn Engines)
- Catalyst abatement efficiencies are 90% for NO_x, 80% for CO, and 50% for POC

Compound	AP-42 Factor (lb/MMBtu)	IC Engine Emissions		Abated Emissions (lb/yr)	BAAQMD Trigger (lb/yr)	RSA Triggered?
		(lb/day)	(lb/year)			
1,1,2,2-Tetra chloroethane	2.53E-05	9.41E-04	3.36E-01	1.68E-01	3.30E+00	No
1,1,2-Trichloroethane	1.53E-05	5.69E-04	2.03E-01	1.02E-01	1.20E+01	No
1,1-Dichloroethane	1.13E-05	4.20E-04	1.50E-01	7.50E-02	1.20E+02	No
1,2-Dichloroethane	1.13E-05	4.20E-04	1.50E-01	7.50E-02	1.20E+02	No
1,2-Dichloropropane	1.30E-05	4.84E-04	1.73E-01	8.63E-02	1.20E+02	No
1,3-Butadiene	6.63E-04	2.47E-02	8.80E+00	4.40E+00	1.10E+00	Yes
1,3-Dichloropropane	1.27E-05	4.72E-04	1.69E-01	8.43E-02	1.20E+02	No
Acetaldehyde	2.79E-03	1.04E-01	3.71E+01	1.85E+01	7.20E+01	No
Acrolein	2.63E-03	9.78E-02	3.49E+01	1.75E+01	3.90E+00	Yes
Benzene	1.58E-03	5.88E-02	2.10E+01	1.05E+01	6.70E+00	Yes
Butyr/isobutyraldehyde	4.86E-05	1.81E-03	6.45E-01	3.23E-01	n/a	No
Carbon Tetrachloride	1.77E-05	6.58E-04	2.35E-01	1.18E-01	4.60E+00	No
Chlorobenzene	1.29E-05	4.80E-04	1.71E-01	8.57E-02	1.40E+04	No
Chloroform	1.37E-05	5.10E-04	1.82E-01	9.10E-02	3.60E+01	No
Ethane	7.04E-02	2.62E+00	9.35E+02	4.67E+02	n/a	No
Ethylbenzene	2.48E-05	9.23E-04	3.29E-01	1.65E-01	n/a	No
Ethylene Dibromide	2.13E-05	7.92E-04	2.83E-01	1.41E-01	2.70E+00	No
Formaldehyde	2.05E-02	7.63E-01	2.72E+02	1.36E+02	3.30E+01	Yes
Methanol	4.12E-05	1.53E-03	5.47E-01	2.74E-01	1.20E+05	No
Methylene Chloride	4.12E-05	1.53E-03	5.47E-01	2.74E-01	1.90E+02	No
Naphthalene	9.71E-05	3.61E-03	1.29E+00	6.45E-01	2.70E+02	No
PAH	2.74E-06	4.25E-06	3.64E-02	1.82E-02	n/a	No
Styrene	1.19E-05	4.43E-04	1.58E-01	7.90E-02	1.40E+05	No
Toluene	5.58E-04	2.08E-02	7.41E+00	3.71E+00	3.90E+04	No
Vinyl Chloride	7.18E-06	2.67E-04	9.54E-02	4.77E-02	2.50E+00	No
Xylene	1.95E-04	7.25E-03	2.59E+00	1.29E+00	5.80E+04	No

As can be seen, four compounds listed in the table above exceed toxic trigger levels. Hence, toxic risk screening analysis **is** required.

Per the attached 7/19/04 memo from Irma Salinas, results from the health risk screening analysis indicate that the incremental cancer risks from the operation of both S-6 and S-7 combined for the maximally exposed receptors are as follows:

Receptor	Cancer Risk in a Million	Chronic Hazard Index
Industrial	0.604	0.020
Residential	7.994	0.171
Sequoia H.S.	0.012	0.002
Orion Alt. School	0.008	0.001
Summit Prep. H.S.	0.218	0.036

These calculations were done for 8568 hours of operation per year. Since both S-6 and S-7 are considered TBACT, in accordance with the District's Toxic Risk Management Policy, the project meets the District's standard of 10 in a million.

The ISCST3 air dispersion computer model was used to estimate annual average ambient air concentrations. Stack and building parameters for the analysis were based on information provided by the applicant. Estimates of residential risk assume continuous 70-year exposure to annual average TAC concentrations. Off-site workers estimates assume exposure occurs for 46 years out of a 70-year lifetime. The off-site worker adjustment factor is:

$$(46 \text{ years}/70 \text{ years}) = 0.657 * \text{residential risk}$$

Estimates of risk to students assume exposure occurs at a higher breathing rate of 581 L/kg-day compared to 286 L/kg-day for residents during 180 school days per year out of 261 weekdays per year and for 9 years out of a 70-year lifetime. The student adjustment factor is:

$$(581 \text{ L/kg-day} / 286 \text{ L/kg-day}) / (180 \text{ days} / 261 \text{ days}) * (9 \text{ years} / 70 \text{ years}) = 0.180$$

* residential risk

PUBLIC COMMENT

The project is within 1000 feet of two public schools and therefore subject to the public notification requirements of Reg. 2-1-412. The public notice will be posted on the Internet and mailed to all Parents or Guardians with children enrolled at Sequoia High School, Orion Alternative School, and Summit Preparatory High School. It will also be mailed to all residential neighbors located within 1000 feet of the proposed new source of pollution.

STATEMENT OF COMPLIANCE

S-6 and 7 are less than 250 HP and therefore is not subject to the emission rate limits in Regulation 9, Rule 8 ("NO_x and CO from Stationary Internal Combustion Engines"). S-6 and 7 is subject to the monitoring and record keeping requirements of Regulation 9-8-530 and the SO₂ limitations of 9-1-301 (ground-level concentration) and 9-1-304 (0.5% by weight in fuel). Regulation 9-8-530 requirements are incorporated into the proposed permit conditions. Compliance with Regulation 9-1 is very likely since natural gas has negligible sulfur content. Like all combustion sources, S-6 and 7 is subject to Regulation 6 ("Particulate and Visible Emissions"). This engine is not expected to produce visible emissions or fallout in violation of this regulation and will be assumed to be in compliance with Regulation 6 pending a regular inspection.

This application is considered to be ministerial under the District's Regulation 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors in accordance with Permit Handbook Chapter 2.3.

Best Available Control Technology:

BACT is not triggered, since maximum daily emissions for each criteria pollutant do not exceed 10 lbs/day as calculated on page 2.

Offsets:

Offsets must be provided for any new or modified source at a facility that emits more than 15 tons/yr of POC or NO_x. Based on the emission calculations above, offsets are not required for this application.

PSD, NSPS, and NESHAPS do not apply.

PERMIT CONDITIONS

Conditions for S-6 and S-7 Natural Gas Cogeneration Units
Application #9218, Plant #14880, Maguire Correctional Facility:

PC #21692

1. The owner/operator of S-6 and S-7 shall fire the engines exclusively with PUC quality natural gas at a firing rate not to exceed 1.55 MMBtu/hr.
(basis: Cumulative Increase, BACT)
2. The owner/operator shall not operate engines S-6 or S-7 unless NO_x, CO and POC emissions are abated by the properly operated and maintained Three-Way NSCR System.
(basis: Cumulative Increase, BACT)
3. The owner/operator of S-6 and S-7 shall not exceed the following emissions limits:
 NO_x 0.15 g/bhp-hr
 CO 0.60 g/bhp-hr
 POC 0.15 g/bhp-hr
(basis: Cumulative Increase and BACT)
4. The owner/operator of S-6 and 7 shall perform monthly testing with an approved portable instrument or perform annual source tests for NO_x, CO and Oxygen. [basis: Cumulative Increase]
5. The owner/operator shall retain all source test records or portable instrument readings on-site for two years, from the date of entry, and make them available for inspection by District staff upon request.
(basis: BACT, Cumulative Increase, Reg. 9-8-530: Record keeping)

RECOMMENDATION

Issue an Authority to Construct to the Maguire Correctional Facility for:

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EXEMPTIONS

None.

By: _____

Roy Lo
Air Quality Engineering Intern

Date: _____